PROBLEM STATEMENT:

In Bangladesh, there are two primary reasons behind water pollution caused by various industries.

1. Many factories are disposing of large quantities of untreated water near major water sources. The mills have been erected in an illegal manner. Some of these factories have managed to continue their operations despite environmental concerns due to political influence.

As for example: The main causes of river pollution in the Buri Ganga River in Bangladesh are attributed to three significant sources: the tannery industry in Hazaribagh, the dyeing factories in Shyampur, and the Sadarghat Port. Illegally operated 52 factories on the southern bank of the Buriganga River are causing pollution by discharging waste into the river. These factories lack environmental clearance and wastewater treatment facilities, such as Effluent Treatment Plants (ETP). Some factories on the northern bank of the river are also operating illegally.

Here are the points highlighting the causes of river pollution:

1. Tannery Industry in Hazaribagh:

- Over two hundred tanneries in Hazaribagh contribute significantly to river pollution.

- Tanneries discharge various pollutants, including toxic chemicals used in leather processing, into the Buri Ganga River.

- The waste from the tanneries contains harmful substances that adversely affect water quality and aquatic life.

2. Dyeing Factories in Shyampur:

- Shyampur is home to more than a hundred dyeing factories that play a major role in river pollution.

- The dyeing process involves the use of chemicals that are often released untreated into the Buri Ganga, leading to water contamination.

- The cumulative impact of discharges from these dyeing factories contributes to the deterioration of the river's health.

3. Sadarghat Port:

- The Sadarghat Port, serving as a crucial communication point for the southern region, adds to the pollution burden.

- Numerous boats and launches at the Sadarghat Port contribute to oil spills, waste disposal, and other pollutants entering the river.

- The high volume of transportation activities in the port area intensifies the environmental impact on the Buri Ganga River.

4. Transportation in the Southern Region:

- Several water vessels, utilizing the Sadarghat launch terminal, transport goods and people across the southern region.

- The extensive use of water transport results in increased human and industrial activities along the riverbanks, leading to pollution.

2. There is a lack of awareness and information about the pollution caused by all the existing Legally compliant and well-maintained mills and factories. A system to address these issues has not been introduced. For resolving this issue, we need Identification and Mitigation of pollutants. Understanding the types and sources of pollution is crucial for effective government intervention.

OUR SOLUTION:

The proposed blockchain solution aims to address water pollution by establishing a transparent and decentralized system for monitoring industrial activities. Through digital identities, each mill is uniquely identified on the blockchain, storing validated information and essential documents such as permits and environmental impact assessments. Smart contracts enforce compliance rules, automating the validation process. Real-time environmental data from IoT devices is tokenized and securely recorded on the blockchain, allowing for transparent tracking of each mill's impact. The system involves decentralized validation nodes, including government bodies and community representatives, ensuring a collaborative approach. A publicly accessible blockchain explorer facilitates easy verification, promoting accountability, and discouraging illegal practices, thereby contributing to water pollution prevention. We will maintain following things:

1. Mills Validation System:

- Blockchain-Based Identity: Each mill receives a unique digital identity on the blockchain, containing ownership details and validation status.

- Smart Contracts for Compliance: Utilize smart contracts to enforce compliance rules, ensuring mills adhere to legal and environmental standards.

- Decentralized Verification Nodes: Establish decentralized nodes for validation, involving government bodies, environmental organizations, and community representatives.

2. Environmental Impact Monitoring:

- IoT Sensors for Real-time Data: Install IoT sensors for real-time monitoring of environmental parameters like pollution levels and water quality.

- Tokenized Environmental Impact: Tokenize the environmental impact data on the blockchain, representing it in a transparent and tradable format.

3. Pollutants Token System:

- Token Creation and Allocation: Create pollutant tokens on the blockchain based on a mill's environmental impact.

- Marketplace for Trading Tokens: Establish a blockchain-based marketplace for buying and selling pollutant tokens.

- Token Transparency: Record all token transactions on the blockchain for transparency and traceability.

4. Water Pollution Prevention Process:

- Token-Driven Accountability: Encourage mills to reduce pollution by tying it to their pollutant token balance.

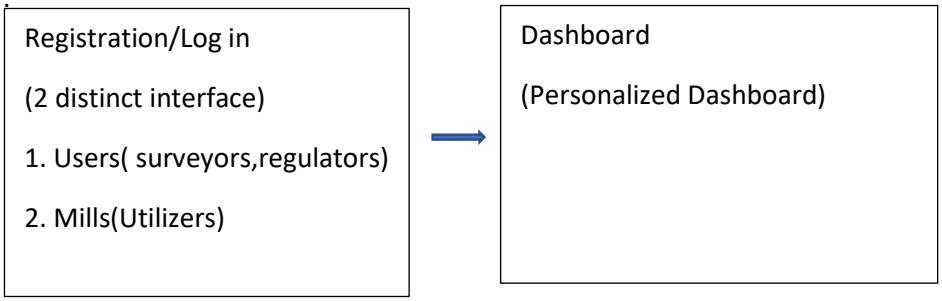
- Regulatory Actions through Smart Contracts: Implement smart contracts that trigger regulatory actions based on predefined pollution thresholds.

5. User-Friendly Interface:

- Dashboard for Mills: Provide mills with a user-friendly dashboard to view their validation status, environmental impact, and pollutant token balances.

- Public Access Explorer: Develop an explorer accessible to the public for verifying mill details, pollutant token transactions, and overall environmental impact.

OUR INTERFACE:



REGISTRATION:

User Registration Form:

1. **User Type:**

- [ ]Surveyor

- [ ] Regulator

2. Full Name:

- [ ] First Name

- [ ] Last Name

3. Contact Information:

- [ ] Email Address

- [ ] Phone Number

4. Organization (if applicable):

- [ ] Organization Name

5. Job Title/Role:

- [ ] Surveyor

- [ ] Regulator

6. Credentials:

- [ ] Create a Username

- [ ] Create a Password

7. Legal document:

a. Professional Certifications:

-Copies of relevant professional certifications or qualifications in environmental science, engineering, or related fields.

b. Government Identification:

-Copies of government-issued identification (e.g., passport, national ID card).

c. Employment Verification:

-Proof of employment or affiliation with a recognized regulatory body or environmental organization.

d. Ethics and Code of Conduct Acknowledgment:

-A signed acknowledgment of adherence to ethical standards and a code of conduct relevant to environmental regulation.

2. **Mill Registration Form:**

1. Mill Type:

- [ ] Specify the type of mill (e.g., Textile, Chemical, etc.)

2. Mill Name:

- [ ] Legal name of the mill

3. Owner Information:

- [ ] Full Name of Mill Owner

- [ ] Contact Information (Email, Phone)

4. Location Details:

- [ ] Address
- [ ] Geographical Coordinates (if applicable)

5. Environmental Compliance Information:
- [ ] Permits and Licenses
- [ ] Environmental Impact Assessment (EIA) Documents

6. Token Wallet Information (for Utilizers):
- [ ] Specify or create a wallet for handling pollutant tokens

7. Credentials:
- [ ] Create a Username
- [ ] Create a Password

8. Additional Information (Optional):
- [ ] Industry Association Memberships
- [ ] Certifications for Environmentally Friendly Practices

9. Legal document

a. Business Registration Documents:

-Copies of official business registration documents issued by the relevant government authorities.

b. Environmental Impact Assessment (EIA) Reports:

-Comprehensive reports assessing the potential environmental impacts of the mill's operations.

Permits and Licenses:

- Copies of permits and licenses obtained from regulatory bodies allowing the mill to operate.

c. Proof of Compliance with Regulatory Standards:

-Documents demonstrating adherence to specific environmental regulations and standards set by the government.

d. Ownership Information:

-Details of mill ownership, including names, contact information, and any partnership or shareholder agreements.

e. Financial Statements (if applicable):

-Financial documents providing an overview of the mill's economic activities.

f. Token Wallet Information (for Utilizers):

-Details of the wallet address where pollutant tokens will be stored and managed.

g. Health and Safety Policies:

-Documentation outlining the mill's health and safety policies, particularly those related to environmental impact.

###**Common Registration Fields for Both:**

- Security Measures:

  - [ ] Two-Factor Authentication (2FA) setup option

- Terms and Conditions:

  - [ ] Checkbox indicating agreement with terms and conditions

- Verification Process:

  - [ ] Instructions on the verification process and required documentation

- Privacy Policy Acknowledgment:

  - [ ] Checkbox indicating acknowledgment of the privacy policy

LOG IN:

1. Username
2. Password

DASHBOARD:

Dashboard for Users (Surveyors and Regulators):

1. Overview:

   - Summary of the current validation status of mills in the system.

   - Pending validation requests and actions needed.

2. Environmental Metrics:

   - Real-time environmental metrics, including aggregated data on pollution levels and water quality.

   - Graphical representations for easy interpretation.

3. Pending Actions:

   - List of pending actions, such as validation requests or regulatory tasks.

   - Ability to prioritize and manage pending tasks.

4. Validation Section:

   - Dedicated section for reviewing and validating mills.

- Access to mill profiles and relevant documents for validation.

5. Notification Center:

- Alerts and notifications related to environmental breaches, pending actions, and system updates.

- Option to customize notification preferences.

6. Reports and Analytics:

- Access to detailed reports and analytics on environmental trends.

- Tools for generating custom reports for regulatory purposes.

7. Help and Support:

- Resources for assistance, including FAQs, user guides, and customer support contacts.

- Reporting mechanisms for technical issues or disputes.

8. Profile and Account Settings:

- Access to user profiles and account settings.

- Options to update personal information and security settings.

Dashboard for Mills (Utilizers):

1. Validation Status:

- Overview of the current validation status and compliance level.

- Indicators for completed validations and upcoming renewal requirements.

2. Environmental Impact Overview:

- Visual representation of the mill's impact on the environment.

- Historical data to track improvements or areas of concern.

3. Token Balances:

- Display of pollutant token balances.

- Information on how tokens are earned and spent.

4. Data Submission Section:

- User-friendly forms for submitting required reports on activities and environmental impact.

- Integration with IoT devices for automated data collection.

5. Token Marketplace:

- Access to the marketplace for buying/selling pollutant tokens.

- Transaction history and transparent pricing.

6. Notifications:

- Alerts for pending actions, validation updates, or token transactions.

- Notifications related to regulatory changes or system updates.

7. Compliance Checklist:

- Clear checklist displaying the environmental regulations the mill must adhere to.

- Real-time status updates on compliance.

8. Educational Resources:

- Access to resources on sustainable practices.

- Tips for reducing environmental impact and earning more pollutant tokens.

9. Profile and Account Settings:

- Access to mill profiles and account settings.

- Options to update mill information, compliance details, and security settings.

Blockchain Platform: Ethereum

Consensus layer

Surveyor Layer:

####To detect the pollution source and scale:

To detect pollution sources and quantify pollution from fixed mills using a blockchain-based system with a surveying team, we can leverage a combination of IoT (Internet of Things) devices and ML (Machine Learning) techniques across different layers of your system. Here's a breakdown of potential applications for IoT and ML (Convolutional Neural Network (CNN)) in each layer:

1. Data Collection Layer:

- IoT Devices:

  - Deploy environmental sensors (IoT devices) near fixed mills to measure parameters

  - Use cameras or image sensors to monitor visual aspects of pollution.

2. Data Processing and Pre-Validation Layer:

- IoT Devices:

  - Continue using environmental sensors for continuous data collection.

- Machine Learning:

  - Apply ML algorithms to preprocess and filter raw sensor data.

- Develop anomaly detection models to identify unusual patterns or pollution events.

3. Data Validation and Verification Layer:

- IoT Devices:

- Integrate sensors that cross-verify environmental parameters to ensure data accuracy.

- Machine Learning:

- Implement ML models for data validation, identifying discrepancies or inconsistencies.

- Use ML for automated verification of submitted documentation and reports.

4. Data Aggregation and Smart Contracts Layer:

- IoT Devices:

- Continue aggregating data from multiple sensors to provide a comprehensive view of the mill's environmental impact.

- Machine Learning:

- Implement ML models to analyze aggregated data trends and identify potential correlations.

- Smart Contracts:

- Embed smart contracts to automate token generation based on pollution levels.

5. Blockchain Layer:

- IoT Devices:

- Utilize blockchain to store securely timestamped and immutable data from IoT devices.

- Machine Learning:

- Embed ML models to continuously learn and adapt to changing pollution patterns.

- Smart Contracts:

- Implement smart contracts for automated validation, triggering actions based on predefined pollution thresholds.

Additional Considerations:

- Edge Computing:

- Use edge computing to process data locally near IoT devices, reducing latency and improving real-time responsiveness.

- Communication Protocols:

- Employ secure and efficient communication protocols for transmitting data between IoT devices and the blockchain system.

- Energy Efficiency:

- Consider energy-efficient IoT devices to minimize the environmental impact of data collection.

- Privacy and Compliance:

- Ensure compliance with privacy regulations when collecting and processing environmental data.

- Continuous Improvement:

- Implement a feedback loop to continuously improve ML models based on new data and evolving pollution patterns.

####To detect the transparent pollution reduction program :

To ensure transparency in the campaigns and provide a verifiable proof of the working flow using blockchain, we will implement a system that integrates technology at various layers. Here's a suggestion for adding layers to surveyors to enhance transparency:

1.Blockchain Integration:

- Smart Contracts:

- Utilize smart contracts on the blockchain to automate and enforce the rules of the campaigns.

- Define the criteria for transparency, including data submission, rewards distribution, and verification processes.

- Decentralized Ledger:

- Use a decentralized ledger to securely record all campaign-related transactions, including the issuance of pollutant tokens, rewards, and any changes to campaign parameters.

- Public Access:

- Ensure that the blockchain ledger is publicly accessible, allowing anyone to verify the transactions and actions taken during the campaigns.

2. Surveyor Layer:

- Blockchain Credentials:

- Provide surveyors with unique blockchain-based credentials to authenticate their identity and actions.

- Use cryptographic signatures to ensure the integrity of data submitted by surveyors.

- Mobile Applications:

- Develop a mobile application for surveyors that integrates with the blockchain.

- Surveyors can use the app to submit real-time data, including images, videos, and campaign progress updates.

- IoT Devices:

- Equip surveyors with IoT devices to collect and transmit environmental data directly to the blockchain.

- Ensure that the data collected is timestamped and immutable.

- GPS Tracking:

- Integrate GPS tracking into the surveyor's tools to validate their physical location during data collection.

- Timestamp the location data on the blockchain to establish a clear timeline.

3. Data Verification Layer:

- Consensus Mechanism:

- Implement a consensus mechanism involving multiple parties (e.g., surveyors, environmental experts) to verify the accuracy of submitted data.

- Use blockchain-based voting or validation processes to achieve consensus.

- Third-Party Validators:

- Introduce third-party validators, such as environmental agencies or NGOs, to independently verify the data submitted by surveyors.

- Their validation results can be recorded on the blockchain for transparency.

4. User Interface for Verification:

- Blockchain Explorer:

- Develop a user-friendly blockchain explorer that allows stakeholders, the public, and regulators to track and verify campaign-related transactions.

- Include detailed information about each transaction, such as the surveyor's identity, timestamp, and submitted data.

- Real-Time Dashboards:

- Create real-time dashboards that display the progress of campaigns, data submission status, and the impact achieved.

- Integrate visualizations to make the information easily understandable.

- Notification System:

- Implement a notification system that sends alerts to stakeholders when significant events occur, such as data verification completion or rewards distribution.

5. Immutable Records and Timestamps:

- Immutable Documentation:

- Store campaign documentation, including rules, criteria, and participant agreements, as immutable records on the blockchain.

- Timestamp all documentation to establish a clear historical record.

- Proof of Timestamp:

- Integrate proof of timestamp mechanisms into the campaign workflow to demonstrate the sequence of events.

- Timestamps should be recorded on the blockchain for tamper-proof verification.

6. Public Participation and Feedback:

- Community Engagement Platform:

- Establish a community engagement platform that allows the public to contribute feedback, suggestions, and observations.

- Integrate this platform with the blockchain to transparently record community input.

- Token Distribution Transparency:

- Clearly outline the criteria for pollutant token distribution and rewards in publicly accessible documentation.

- Use the blockchain to transparently distribute tokens based on verifiable actions.

7. Educational Resources:

- Blockchain-Based Training:

- Develop blockchain-based training modules for surveyors to educate them on the importance of transparency and accurate data submission.

- Record completion and participation on the blockchain.

- Publicly Accessible Training Records:

- Ensure that surveyor training records are publicly accessible on the blockchain to validate their expertise.

8. Compliance with Regulatory Standards:

- Regulatory Reporting:

- Work closely with regulatory bodies to ensure that the campaign's data and actions comply with environmental regulations.

- Automate the generation of compliance reports on the blockchain.

- Audit Trail:

- Maintain an audit trail on the blockchain, recording any modifications or updates to campaign parameters.

- This ensures a transparent record of changes and compliance with regulations.

To integrate the offline data:

Inputting offline data transparently into a blockchain-based system involves careful planning and integration of mechanisms to ensure data integrity when connectivity is restored. Here's a suggested approach:

1. Offline Data Collection:

- Develop a mobile application for surveyors that allows them to collect data even when offline.

- Include functionalities for capturing images, videos, and other relevant information.

2. Local Storage and Encryption:

- Implement local storage on the surveyor's device to temporarily store collected data.

- Encrypt the locally stored data to maintain security and prevent unauthorized access.

3. Timestamping:

- Add a timestamp to each piece of offline-collected data to establish when it was recorded.

- Ensure that the timestamp is accurate and aligned with the surveyor's local time.

4. Blockchain-Based Commit Logs:

- Develop a commit log system on the surveyor's device that records all changes made to the offline data.

- This commit log will serve as a transparent record of modifications.

5. Data Compression:

- Implement data compression techniques to reduce the size of the offline data, making it easier to transmit once connectivity is restored.

6. Automated Sync Mechanism:

- Create an automated synchronization mechanism that initiates when the device regains internet connectivity.

- This mechanism should securely transmit the locally stored, timestamped data to the blockchain.

7. Blockchain Transaction Queue:

- Design a transaction queue within the mobile application that manages the order and integrity of data submissions.

- Ensure that the queue follows the first-in, first-out (FIFO) principle to maintain chronological accuracy.

8.Data Verification upon Sync:

- Before data is submitted to the blockchain, implement a verification process to ensure its integrity.

- Check for any inconsistencies, missing information, or signs of tampering.

9. Proof of Timestamp:

- Use cryptographic techniques to create a proof of timestamp for each set of offline data.

- This proof will serve as an additional layer of verification when the data is submitted.

10. Smart Contracts for Verification:

- Employ smart contracts on the blockchain to automate the verification process.

- Smart contracts can compare the received offline data against predefined criteria and rules.

11. Blockchain Explorer for Transparency:

- Design a user interface or blockchain explorer that allows stakeholders to track the progress of offline data submissions.

- Provide detailed information on when each set of data was collected, timestamped, and submitted.

12. User Notifications:

- Implement a notification system that informs surveyors when their offline data has been successfully submitted and recorded on the blockchain.

- Include information about the status of the submission (e.g., success or any issues encountered).

13. Documentation and Logging:

- Keep comprehensive documentation of the offline data submission process.

- Log any errors, exceptions, or irregularities for later analysis and improvement.

14. Periodic Data Integrity Audits:

- Conduct periodic audits of the data stored on the blockchain to ensure ongoing data integrity.

- Address any discrepancies or anomalies promptly.

15. Encryption Key Management:

- Implement robust key management practices for encrypting and decrypting offline data.

- Regularly update encryption keys and store them securely.

.**The list of rivers having pollution:**

In Gazipur:

1. Lobondaho River in Gazipur, Haringhata in Narayanganj, and Sutang in Habiganj face severe water pollution.

2. The oxygen levels in these rivers are alarming, with Lobondaho, Haringhata, and Sutang having less than 1 milligram per liter.

Dhaka and Narayanganj Rivers:

3. Rivers like Buriganga, Tongi Khal, Shitalakshya, Dhaleshwari, Lobondaho in Gazipur, and Haringhata in Narayanganj exhibit less than 1 milligram per liter of oxygen in their waters.

4. In Dhaka division's Balu and Turag rivers, the oxygen levels are less than 2 milligrams per liter.

Sylhet and Barisal Rivers:

5. Rivers Sutang in Sylhet and Kirtonkhola in Barishal also show oxygen levels less than 1 milligram per liter.

6. In Barisal division, Ramnabad, Andharmanik, Khapra Bhanga, and Boleshwar rivers are severely affected by plastic pollution.

Overall Observations:

7. Among 56 surveyed rivers, 19 rivers in Dhaka division are severely polluted, with oxygen levels less than 1 milligram per liter.

8. In the dry season, 25 out of 56 rivers exhibit oxygen levels less than 5 milligrams per liter, impacting fish and aquatic organisms.

Barisal Division:

9. In Barisal division, five rivers, including Kirtonkhola, are affected by plastic pollution.

10. Plastic pollution affects 16 rivers, including Lobondaho, Haringhata, Sutang, and Kirtonkhola.

11. 35 rivers are polluted due to plastic, industrial waste, and municipal waste disposal.

Identity Layer:

The access to data for mills, surveyors, and regulators in a blockchain-based environmental regulation system needs to be carefully designed to balance transparency, privacy, and regulatory compliance. Here's a breakdown of the data access for each role:

1. Mills (Utilizers):

- Own Environmental Impact Data:

    - Mills should have access to real-time and historical data related to their environmental impact.
    - This includes data collected from the deployed sensors
- Token Balances:
    - Information on the pollutant token balances associated with their environmental impact.
    - Access to the transaction history in the token marketplace.
- Validation Status:
    - Information about the current validation status of their operations.
    - Details on compliance with environmental regulations.
- Data Submission Forms:
    - User-friendly interfaces for submitting required reports on activities and environmental impact.
    - Integration with IoT devices for streamlined data submission.
- Educational Resources:
    - Access to resources on sustainable practices and guidelines to reduce environmental impact.
    - Tips for earning more pollutant tokens through environmentally friendly practices.

2. Surveyors:

- Pending Validation Requests:
    - Surveyors should have access to a dashboard showing pending validation requests from mills.
    - Detailed information about each mill's documentation and environmental impact.
- Environmental Metrics Overview:
    - Real-time environmental metrics aggregated from various mills.
    - Graphical representations for easy interpretation.
- Validation Section:
    - Dedicated interfaces for reviewing and validating mills.
    - Access to mill profiles and relevant documents during the validation process.
- Notification Center:
    - Alerts and notifications related to pending actions, validation results, or system updates.
    - Customizable notification preferences.

3. Regulators:

- Comprehensive Environmental Data:

  - Access to a comprehensive overview of environmental data aggregated from all mills.

  - Granular details on pollution levels, compliance status, and trends.

- Regulatory Dashboard:

  - A dashboard specifically designed for regulators to monitor and manage the overall regulatory landscape.

  - Tools for generating custom reports for regulatory purposes.

- Smart Contracts and Compliance:

  - Access to information regarding the implementation of smart contracts for compliance monitoring.

  - Real-time insights into regulatory actions triggered by smart contracts.

- Identity Verification Processes:

  - Information related to the identity verification processes of mills and surveyors.

  - Ensures that all participants in the system are duly verified and authorized.

- Data Analytics and Trends:

  - Advanced analytics tools to analyze trends in environmental data and pollution sources.

  - Historical data for regulatory decision-making.

Programs we will conduct after selling the token:

Waste Management Initiatives:

1. Community-Led Cleanup Campaigns:

  - Organize regular cleanup campaigns involving local communities to collect and properly dispose of waste in and around the affected areas.

  - Reward active participants with pollutant tokens to encourage community engagement.

2. Establish Recycling Centers:

  - Set up recycling centers in strategic locations to facilitate the proper disposal and recycling of plastic and other recyclable materials.

  - Provide pollutant tokens to individuals or communities for delivering recyclable materials.

3. Educational Programs:

- Conduct awareness and educational programs on proper waste disposal practices, recycling, and the environmental impact of pollution.

- Use pollutant tokens as incentives for attending and actively participating in these programs.

4. Invest in Waste Collection Infrastructure:

- Invest in waste collection infrastructure, such as garbage bins and collection vehicles, to streamline the process of waste disposal.

- Allocate pollutant tokens based on the effectiveness of waste collection efforts.

Water Treatment Initiatives:

1. Deploy Floating Treatment Platforms:

- Introduce floating treatment platforms equipped with water treatment technologies in heavily polluted areas.

- Use these platforms to actively treat the water and improve its quality.

2. Aeration Systems:

- Implement aeration systems in stagnant water bodies to enhance oxygen levels and promote the natural breakdown of pollutants.

- Allocate pollutant tokens based on the improvement observed.

3. Vegetative Buffer Zones:

- Establish vegetative buffer zones along riverbanks to naturally filter pollutants from runoff water.

- Offer pollutant tokens to communities involved in planting and maintaining these buffer zones.

4. Bio-remediation Projects:

- Launch bio-remediation projects that involve the use of specific plants or microorganisms to absorb or break down pollutants.

- Reward communities or individuals involved in these projects with pollutant tokens.

5. Water Quality Monitoring:

- Set up a water quality monitoring system using IoT devices to track changes in water quality over time.

- Provide pollutant tokens based on improvements in monitored water quality.

6. Collaborate with NGOs and Environmental Groups:

- Collaborate with non-governmental organizations (NGOs) and environmental groups with expertise in water treatment.

- Allocate pollutant tokens to these organizations for successful implementation of water treatment projects.